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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/733,675
Filing Date: December 11, 2003
Appellant(s): TRUTNA ET AL.

John M Harman
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 29, 2009 appealing from the Office action mailed September 4, 2008.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,839,335	Sudo	1-2005
6,680,928	Dent	1-2004
2004/0246973	Hoang et al	12-2004
2002/0150070	Shattil	10-2002
4,835,517	Van der Gracht et al	5-1989
2002/0021464	Way	2-2002
7,187,715	Balachandran et al	3-2007
A Symmetric-Structure CDMA-PON System and Its Implementation, IEEE PHOTONICS TECHNOLOGY LETTERS, VOL. 14, NO. 9, SEPTEMBER 2002	Ahn et al	9-2002

(9) Grounds of Rejection

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo (US 6,839,335), further in view of Dent (US 6,680,928) and Hoang et al (US 2004/0246973).

As to claim 1, Sudo discloses a method of and an apparatus for transmitting information signals via multiple transmission channels comprising: encoding each information signal with a respective spreading code to generate a coded signal corresponding to each bit of the spreading code, the spreading codes are mutually different (Fig. 1, means 1 and spreading codes 1-n; Col. 1, Lines 28-34); allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels (Fig. 1; Col. 1, Lines 57-64). Sudo does not expressly disclose in each of the transmission channels, analog summing the coded signals allocated thereto to generate a modulation signal; and generating an optical transmission signal in response to the modulation signal. One of ordinary skill in the art would recognize it is obvious that assigning/ allocating the coded signals corresponding to the same bits of the spreading codes to a transmission channel is obtained by summing the coded signals allocated thereto. In other words, in order to allocate a plurality of bits or symbols to a transmission channel those bits or symbols are summed

as it is evidenced, for example, by Dent (Fig. 1, means 24; Fig. 2, means 58; Col. 3, lines 24-27; Col. 6, lines 4-22). Also, one of ordinary skill in the art would recognize that the summation could be performed digitally or in analog domain, wherein the analog summer is advantageous since it is typically smaller than its digital counterpart. Hoang discloses that wavelength division multiplexing is a form of frequency division multiplexing and the carrier frequencies could be replaced by carrier wavelengths (Par. 11). Therefore, it would have been obvious to one of ordinary skill in the art to transmit first bits of plurality of encoded information signals on the same wavelength subcarrier instead of frequency subcarrier and so forth as taught by Hoang in order to rapidly convey large amount of information between two points with very low loss by utilizing an optical transmission scheme.

As to claim 2, Sudo further discloses that the spreading codes are orthogonal (Col. 1, Lines 28-34).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Hoang et al, further in view of Shattil (US 2002/0150070).

As to claim 3, Sudo, Dent, and Hoang teach all the subject matter claimed in claim 1, except for the spreading codes are mutually quasi-orthogonal. One of ordinary skill in the art would recognize that different types of spreading codes such as orthogonal and quasi-orthogonal spreading codes could be utilized depending on the design requirements, wherein each one has an advantage and a disadvantage, for example generally quasi-orthogonal codes are not preferred over orthogonal codes

because of the issue of interference; in contrast, quasi-orthogonal codes are less restricted since more quasi-orthogonal codes can be generated comparing to orthogonal codes as it is evidenced by Shattil (US 2002/0150070).Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Shattil with Sudo, Dent, and Hoang for the reason stated above.

Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Hoang, further in view of van der Gracht et al (US 4,835,517).

As to claims 4-5, Sudo, Dent, and Hoang teach all the subject matter claimed in claim 1, except for spreading comprises exclusive-NORing each information signal with the bits of the respective code. One of ordinary skill in the art would clearly recognize that it is well known in the art to perform multiplication utilizing either XOR or XNOR logic gates, wherein the spreading code comprises a plurality of bits as it is evidenced by van der Gracht (Col. 4, Lines 47-48). Therefore, it would have been obvious to combine the teaching of van der Gracht with Sudo, Dent, and Hoang in order to spread the information signal by multiplying the information signal by a spreading code.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Hoang et al, further in view of Balachandran et al (US 7,187,715).

As to claims 6, Sudo, Dent, and Hoang teach all the subject matter claimed above, except for each spreading code comprises bits each in one of a first state (i.e. +1) and a second state (-1); and the encoding comprises for each bit of the spreading

code in the first state, outputting the information signal as the coded signal corresponding to the bit of the spreading code; and for each bit of the spreading code in the second state, inverting the information signal and outputting the inverted information signal as the coded signal corresponding to the bit of the spreading code. One of ordinary skill in the art would recognize that it is well known in the art to spread the information signal, wherein each spreading code comprises bits each in one of a first state (i.e. +1) and a second state (-1); and the encoding comprises for each bit of the spreading code in the first state, outputting the information signal as the coded signal corresponding to the bit of the spreading code; and for each bit of the spreading code in the second state, inverting the information signal and outputting the inverted information signal as the coded signal corresponding to the bit of the spreading code as it is evidenced by Balachandran (Fig. 5, parts b and c). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Balachandran with Sudo, Dent, and Hoang in order to spread the information signal to be transmitted by multiplying each bit of the information signal with the corresponding bit of the spreading code in order to reduce power consumption in the communication system.

Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo (US 6,839,335), further in view of Dent and Ahn et al (A Symmetric-Structure CDMA-PON System and Its Implementation, IEEE PHOTONICS TECHNOLOGY LETTERS, VOL. 14, NO. 9, SEPTEMBER 2002).

As to claim 11, Sudo discloses a method of and an apparatus for transmitting information signals via multiple transmission channels comprising: encoding each information signal with a respective spreading code to generate a coded signal corresponding to each bit of the spreading code, the spreading codes are mutually different (Fig. 1, means 1 and spreading codes 1-n; Col. 1, Lines 28-34); allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels (Fig. 1; Col. 1, Lines 57-64); and modulating the coded signals on each channel (Fig. 1, means 4). Sudo does not expressly disclose in each of the transmission channels, analog summing the coded signals allocated thereto to generate a modulation signal; and a transmitter comprising a modulation input connected to the output of the analog summer. One of ordinary skill in the art would recognize it is obvious that assigning/ allocating the coded signals corresponding to the same bits of the spreading codes to a transmission channel is obtained by summing the coded signals allocated thereto. In other words, in order to allocate a plurality of bits or symbols to a transmission channel those bits or symbols are summed as it is evidenced for example by Dent (Fig. 1, means 24; Fig. 2, means 58; Col. 6, lines 4-22). Also, one of ordinary skill in the art would recognize that the summation could be performed digitally or in analog domain, wherein the analog summer is advantageous since it is typically smaller than its digital counterpart. Ahn discloses employing a WDM-CDMA transmitter, wherein the output of the CDMA signal is inputted to an optical transmitter comprising a modulation input (Fig. 1, wherein the output of the combiner is modulated in the optical transmitter) in order to suppress the optical beat noise (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Ahn with Sudo and Dent for the reason stated above.

As to claim 12, Sudo further discloses that the spreading codes are orthogonal (Col. 1, Lines 28-34).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Ahn et al, further in view of Shattil (US 2002/0150070).

As to claim13, Sudo, Dent, and Ahn teach the entire subject matter claimed in claim 1, except for the spreading codes are mutually quasi-orthogonal. One of ordinary skill in the art would recognize that different types of spreading codes such as orthogonal and quasi-orthogonal spreading codes could be utilized depending on the design requirements, wherein each one has an advantage and a disadvantage, for example generally quasi-orthogonal codes are not preferred over orthogonal codes because of the issue of interference; in contrast, quasi-orthogonal codes are less restricted since more quasi-orthogonal codes can be generated comparing to orthogonal codes as it is evidenced by Shattil (US 2002/0150070). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Shattil with Sudo, Dent, and Ahn for the reason stated above.

Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Ahn et al, further in view of Way (US 2002/0021464).

As to claims 14-16, Sudo discloses utilizing frequency division multiplexing scheme to transmit information signals. Sudo, Dent, and Ahn are not explicit about the

transmitter additionally comprises optical transmitter coupled to each transmission channel, wherein the output of the optical transmitters are connected to a multiplexer and the output of the multiplexer is coupled to a transmission medium that is optical fiber. Way discloses a type of frequency division multiplexing method comprising optical transmitters (Fig. 1, means 20) that are connected to a multiplexer (means 26), wherein the output of the multiplexer is coupled to a transmission medium that is optical fiber (means 16; Par. 3 and 27-29). Therefore, it would have been obvious to combine the teaching of Way with Sudo, Dent, and Ahn in order to rapidly convey large amount of information between two points with very low loss by utilizing an optical network instead (Par. 3).

Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Ahn et al, further in view of van der Gracht et al (US 4,835,517).

As to claims 17-18, Sudo, Dent, and Ahn teach all the subject matter claimed in claim 1, except for spreading comprises exclusive-NORing each information signal with the bits of the respective code. One of ordinary skill in the art would clearly recognize that it is well known in the art to perform multiplication utilizing either XOR or XNOR logic gates, wherein the spreading code comprises a plurality of bits as it is evidenced by van der Gracht (Col. 4, Lines 47-48). Therefore, it would have been obvious to combine the teaching of van der Gracht with Sudo, Dent, and Ahn in order to spread the information signal by multiplying the information signal by a spreading code.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo, Dent, and Ahn et al, further in view of Balachandran et al (US 7,187,715).

As to claim 19, Sudo, Dent, and Ahn teach all the subject matter claimed above, except for each spreading code comprises bits each in one of a first state (i.e. +1) and a second state (-1); and the encoding comprises for each bit of the spreading code in the first state, outputting the information signal as the coded signal corresponding to the bit of the spreading code; and for each bit of the spreading code in the second state, inverting the information signal and outputting the inverted information signal as the coded signal corresponding to the bit of the spreading code. One of ordinary skill in the art would recognize that it is well known in the art to spread the information signal, wherein each spreading code comprises bits each in one of a first state (i.e. +1) and a second state (-1); and the encoding comprises for each bit of the spreading code in the first state, outputting the information signal as the coded signal corresponding to the bit of the spreading code; and for each bit of the spreading code in the second state, inverting the information signal and outputting the inverted information signal as the coded signal corresponding to the bit of the spreading code as it is evidenced by Balachandran (Fig. 5, parts b and c). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Balachandran with Sudo, Dent, and Ahn in order to spread the information signal to be transmitted by multiplying each bit of the information signal with the corresponding bit of the spreading code in order to reduce power consumption in the communication system.

(10) Response to Argument

(A) Introduction

Prior to responding to the arguments, the examiner would like to describe the field of the invention.

MC-CDMA, which is a multi-carrier transmission technique, combines advantages of both conventional Frequency Division Multiplexing (FDM) and Code Division Multiple Access (CDMA) transmission technologies. In other words, the biggest advantage of MC-CDMA is that it can achieve frequency diversity and relatively higher bandwidth benefit at the same time. As in an FDM system, MC-CDMA can allocate available frequency bands to several low transmission rate and orthogonal sub-carriers. MC-CDMA is different from Direct Sequence Code Division Multiple Access (DS-CDMA) that requires a high complexity rake receiver and interference-suppression technology to achieve a preferred frequency diversity effect. Utilizing an ordinary frequency-domain equalizing technology, MC-CDMA can still maintain a good bit error rate (BER) performance even under condition of multi-user coexistence. In other words, MC-CDMA can be considered as an FDM system that applies a spread spectrum signal in the frequency-domain.

(B) Descriptions of Sudo, Dent, and Hoang references

Sudo discloses a multi-carrier transmission technique that combines CDMA transmission technology with FDM by allocating the coded signals that are encoded by a plurality of mutually different spreading codes corresponding to the same bits of the spreading codes to a transmission channel.

Dent is an exemplary piece of prior art to show that in order for a plurality of bits to be allocated to a transmission channel, the plurality of bits should be combined/summed prior to transmission.

Hoang teaches WDM (Wavelength Division Multiplexing) is a form of FDM (Frequency Division Multiplexing). When implementing WDM, similar to FDM, each of multiple carrier wavelengths (or, equivalently, frequencies or colors) is used to provide a communication channel.

Ahn discloses employing a WDM-CDMA transmitter, wherein the output of the CDMA signal is inputted to an optical transmitter comprising a modulation input.

(C) Response to Argument(s)

The examiner discusses the claims in the same order as the Appellant.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo (US 6,839,335), further in view of Dent (US 6,680,928) and Hoang et al (US 2004/0246973).

Regarding claim 1, the appellant has presented three distinct arguments, which are as follows:

I. Regarding claim 1, pages 8-10, the appellant argues *"The Appellants respectfully note that Sudo is not allocating spread-spectrum encoded transmission signals in the same or similar manner as in the Appellants' claimed invention as recited in claim 1. More specifically, in Sudo, the intermediate processes occurring between what the Examiner states discloses the Appellants' encoding step and what the Examiner states discloses the Appellants' allocating step actually transform (<u>by performing additional processes on</u>) the spread-spectrum encoded transmission signals after such signals have been output from the spreading sections (1) and before such signals are input to the IFFT (allocation) section (4). Thus, different signal information is being allocated in Sudo than is being allocated in the Appellants' claimed invention as recited in claim 1. Because of Sudo's additional processing, the transmission signals input to the IFFT section can not possibly be the same kind of transmission signals as the transmission signals <u>allocated directly</u> in the Appellants' claimed method. Accordingly, the respective allocation processes are different, at least in the sense that different information is being allocated in Sudo than is being allocated in the Appellants' claimed invention. As a result, regardless of any similarities or differences of any remaining transmission method steps, the signal transmission method in Sudo, even combined with the teachings of other references, can not disclose or even suggest the Appellants' claimed invention as recited in claim 1.*

In the Appellants' independent claim 1, the encoding step recites "generating a coded

signal corresponding to each bit of the spreading code," and the allocating step recites "allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels." Furthermore, as shown in the Appellants' Fig. 2, and as described in the specification, e.g., at paragraph [0036], the signal allocator (allocating circuit 25), which performs the allocation step, has direct connections between the outputs of the spread-spectrum encoders 21-24, which perform the encoding step, and the inputs of the analog summers 36-39. Therefore, the "coded signals" generated by the encoding step are the same "coded signals" that are allocated by the allocating step. Accordingly, it is clear that the Appellants' claimed method does not have any additional processing sections or perform any additional processes on the coded signals generated by the encoding step before those coded signals are allocated by the allocating step... Also, there is nothing in Sudo to suggest that the addition section (2) and the SIP converter section (3) are not necessary for proper operation of the transmission method cited in Sudo. Therefore, the removal of the addition section (2) and a Serial- Parallel (S/P) converter (3) in Sudo would change the principle of operation and almost certainly destroy the intended purpose of Sudo's transmission method."

In response to the first argument set forth above, the examiner disagrees with the appellant because:

(1) Claim 1 uses the term "comprising" not "consisting of".

(2) The claimed subject matter of "allocating the coded signals corresponding to the same bit of the spreading codes to a respective one of the transmission channels" is

taught by Sudo, which means that, in terms of functionality, the recited claimed subject matter is similar to the teaching of Sudo.

(3) The examiner made the broadest reasonable interpretation of the claimed subject matte, in which the recited claimed subject matter includes the three stages of addition, serial to parallel converter, and IFFT (Inverse Fourier Transformation) combined since it meets the functionality requirement.

II. Regarding claim 1, page 11, the appellant argues "*The Appellants' allocating step allocates the same bits of the spreading codes to a respective one of the transmission channels before summing the coded signals. For example, the first bits of a plurality of different encoded information signals are input to an analog summer of a first transmission channel, while the second bits of the plurality of different encoded information signals are input to an analog summer of a second transmission channel. By comparison, in Sudo, the spread signals added by the addition section (2), and divided and disassembled by the SIP converter section (3) into individual chips (bits) for each spread signal, are then allocated to a corresponding subcarrier (i.e., frequency division multiplexed) using the IFFT processing section (4). See the cited language in col. 1, lines 57-64 of Sudo.*"

In response to the second argument set forth above, the examiner disagrees with the appellant because the examiner acknowledges the fact that the claimed invention utilizes WDM transmission technology instead of FDM transmission technology and Hoang presented to show that WDM transmission technology could replace FDM

transmission technology that uses IFFT since WDM is a form of FDM. When implementing WDM, similar to FDM, each of multiple carrier wavelengths (or, equivalently, frequencies or colors) is used to provide a communication channel.

III. Regarding claim 1, page 12, the appellant argues *"The Dent reference, which is cited for its disclosure of summing spread-spectrum coded signals, does not cure the deficiencies of Sudo in failing to disclose or suggest the Appellants' invention as recited in claim 1. The Examiner cited the combiner (24) in Fig. 1 and the combiner (58) in Fig. 2 as examples of summing spread-spectrum coded signals assigned or allocated to the same transmission channel. The Appellants note that the cited combiners in Dent each combine the entire spread-spectrum coded signal of a plurality of spread-spectrum coded signals to generate a single, composite modulation signal. However, there is no suggestion in Dent of summing the same bits of each of a plurality of spreading code coded signals using a corresponding plurality of analog summers for each of the same bits from each of the plurality of spreading code coded signals to generate a corresponding plurality of modulation signals, as in the Appellants' invention as recited in claim 1. Regardless, the teachings of Dent do not cure the deficiencies of Sudo in failing to disclose or suggest the direct allocation in the Appellants' invention as recited in claim 1."*

In response to the third argument set forth above, the examiner disagrees with the appellant because Dent is an exemplary piece of prior art to prove that in order

for a plurality of bits to be allocated to a transmission channel, the plurality of bits should be combined/summed prior to transmission.

Claims 3-6 and 11-19 appear to be identical to the argument of claim 1. Therefore, the response to argument for claims 3-6 and 11-19 is the same as the response to argument of claims 1 and 19 stated above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Freshteh N Aghdam

/F. N. A./

Examiner, Art Unit 2611

April 21, 2009

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